

programs. This analysis separately looked at the residential and commercial programs, and separately looked at programs to save natural gas and electricity. Most of this program cost data combined the residential and commercial sectors, so we first calculated average cost per unit gas and electricity savings across programs, and then adjusted these costs to reflect the cost of commercial versus residential programs.

In the case of electricity savings, available data covered programs operated in California, Vermont, and Massachusetts, as well as projected program costs from a study of six mountain states. Overall, we found that on average, programs cost \$0.03 per kWh saved. For gas savings, available data covered programs in Vermont, Minnesota, and projected program costs in Washington and New York. Overall, we found that programs cost an average of \$0.15 per Therm saved. To adjust these averages to reflect differences between the residential and commercial sectors, we looked at several studies that examined either program costs or program benefit-cost by sector. This analysis included studies of electric programs from Massachusetts, Connecticut and the mountain states, and studies on gas programs from Vermont and New York. Based on these studies, we calculated average ratios of residential sector program costs to total program costs, and commercial sector program costs to total program costs. In general, residential sector programs are more expensive per kWh or Therm saved than commercial programs. For example, for electric programs, as noted above, the average residential program had costs per kWh saved 36% higher than the average program (e.g., \$0.041/kWh saved for residential versus \$0.03/kWh saved for the average program) while the average commercial program had costs per kWh saved 21% lower than the average program (e.g. \$0.024/kWh saved for commercial versus \$0.03/kWh saved for the average program). Calculations by sector for both electric and gas programs are shown in Table 22.

Table 22. Residential and Commercial Costs of Saved Energy

Resource	Technology Costs (Customer-Borne)	Administrative Adder	Total Cost of Energy Savings
Residential Energy Efficiency			
Electricity	\$0.041/kWh	25%	\$0.051/kWh
Natural Gas	\$2.400/MCF	25%	\$3.000/MCF
Commercial Energy Efficiency			
Electricity	\$0.024/kWh	20%	\$0.029/kWh
Natural Gas	\$0.800/MCF	20%	\$0.960/MCF

Industrial Sector Methodology

There remains a great wealth of cost-effective measures for both electric and natural gas efficiency in the industrial sector. Several good sources of "real-world" data regarding energy efficiency improvements exist for this sector. One of the best sources of this data is the Industrial Assessment Center (IAC) database⁴. The IAC Program, direct, one-to-one contact with industrial end-users and plant site managers significantly increases the adoption of commercially available and emerging energy-efficient technologies. In addition to

⁴ Since the program's inception in the 1970s, data has been collected on recommendations, implementation, and costs. The database is available at <http://iac.rutgers.edu/database/>.

traditional energy streams, IAC targets waste streams and productivity improvements. The program is focused on preparing energy and waste audits of small-to medium-sized manufacturing facilities. IAC is implemented through 26 universities.

In order to determine the customer cost of efficiency improvements in the industrial sector, data from implemented recommendations was obtained from the IAC database. Data was obtained for efficiency measures that were implemented between 1995 and the present. There were 3319 electricity efficiency measures and 1637 natural gas efficiency measures in the database. Table 23 shows the total installation costs and first year energy savings of these measures.

Table 23. Installation Costs and First-Year Savings of IAC Projects

Electricity Efficiency Measures		Natural Gas Efficiency Measures	
Total First-Year Electricity Savings (kWh)	246,783,051	Total First-Year Natural Gas Savings (MCF)	3,375,022
Total Implementation Cost	\$19,230,983	Total Implementation Cost	\$8,592,863
Total First-Year \$/kWh Saved	\$0.078	Total First-Year \$/MCF Saved	\$2.546
Cost of Saved Energy (\$/kWh)	\$0.016	Cost of Saved Energy (\$/MCF)	\$0.509

Note: Cost of saved energy figures estimates a typical 5-year capital improvement cycle for industrial facilities.

These figures align with program data provided from the US DOE and other industrial efficiency programs (see Table 24). A comprehensive study of the industrial electric efficiency potential in New York found that a portfolio of 35 different measures would cost an average of \$0.018/kWh saved (NYSERDA 2003). The Steam Saver Programs of the U.S. Department of Energy provides data for 203 boiler and steam projects (DOE 2001). These measures included more extensive and capital intensive project improvements such as boiler unit replacements and heat recovery and economizer projects. These improvements typically have a long equipment life.

Table 24. DOE Steam Saver Program Data

Natural Gas Efficiency Measures	
Total First-Year Natural Gas Savings (MCF)	1,659,295
Total Implementation Cost	\$15,493,967
Total First-Year \$/MCF Saved	\$9.33
Cost of Saved Energy (\$/MCF) (5-year capital cycle)	\$1.866
Cost of Saved Energy (\$/MCF) (15-year capital cycle)	\$0.622

Savings Estimates Used for Industrial Analysis

The data indicates that the technology and programmatic costs of energy efficiency in the industrial sector vary. The tables in the previous section represent some of the best data available for this sector. In summary, the values used to estimate the technological and programmatic costs of delivering efficiency are listed in Table 25.

Table 25. Industrial Cost of Saved Energy

Resource	Technology Costs (Customer-Borne)	Administrative Adder	Total Cost of Energy Savings
Electricity	\$0.016/kWh	15%	\$0.0184/kWh
Natural Gas	\$0.6/MCF	15%	\$0.69/MCF

Renewables Sector Methodology

Because of the limited nature of the renewables analysis, for purposes of cost estimation it was assumed that the vast majority of the new capacity would be wind power. Over the course of our study horizon, certain types of wind power in the United States are the most cost effective of the renewable energy options. The economics of wind power were described by the American Wind Energy Association (AWEA) in a 2002 white paper (AWEA 2002), and depend on many variables, including:

1. Proximity of electricity use to source. The price of onsite wind power is lower because transmission and distribution costs do not need to be included in the price.
2. Size and conditions of wind farms. Large spaces with good wind conditions are the best candidates for higher margin wind power.
3. Size and appropriate configuration of the wind turbine. It is economically important that the wind turbine be the most appropriate and have the best configuration for the wind farm location chosen. Inefficiencies in the wind turbine decrease the economics of the project.
4. The cost of financing. Wind power, like many renewable energy technologies is capital intensive, so the effect of competitive interest rates and expeditious loan processing is large.
5. Tax and environmental regulations. Financially encouraging tax policies as well as tighter environmental regulations create a better environment for wind power.

There are a number of programs that encourage the use of wind power in various sectors. Most of the financial incentives for wind power are state-based tax credits or deductions, including the federal production tax credit that applies to wind energy. In Minnesota, for example, there is a statute that offers an incentive for wind (and other renewable technology) electricity generators (under 2 MW) that are owned by the same person who owns the land they are on of 1.5 cents per kWh (Minn 2002). Several other states (a full list can be found at dsire.org) have similar incentives. Other wind incentive programs, such as NYSERDA's Wind Incentive Program (NYSERDA 2003), support partial funding of wind projects using public benefit fund monies or, in regulated states, the utility money earmarked for efficiency and conservation.

Due to the variables in the economics of wind energy and the financial incentive programs available, there is a large range of average prices for wind power. The AWEA white paper indicates that the range is two to four cents per kWh, when including the federal tax incentive (AWEA 2002). In Texas specifically, AWEA claims wind prices of three to six cents per kWh (with federal incentive) (AWEA 2002). Researchers for the New York State Renewable Portfolio Standard (RPS) team found contract prices for installed wind power as low as 2.6 cents per kWh (NYDPS 2003). There is however still a discrepancy between utility and individually owned prices for wind power, due to economies of scale and general access to

the grid. LBNL's report, *Alternative Windpower Ownership Structures: Financing Terms and Project Costs*, approached the issue of how ownership affects the price of wind power. If a facility that is financed by a wind developer could sell power at about 5 ¢/kWh, the same facility could sell power for about \$0.035/kWh if it were owned by an IOU (Wiser and Kahn 1996).

For this analysis, an average price of \$0.045/kWh for the installation of new renewable energy resources was used. A programmatic adder of \$0.015/kWh was assumed.

Table 26. Renewables Cost of Generation

Resource	Technology Costs (Customer-Borne)	Administrative Adder	Total Cost of Energy Savings
Renewable Energy	\$0.045/kWh	33%	\$0.06/kWh

Discussion of Benefits and Costs

As noted earlier, the ratio of benefits to costs is very attractive. With all of the technology and administrative costs included, the overall benefit to cost ratio is 3.44 (see Table 27). The total benefit to consumer investment ratio is 4.5, while the total benefit to program expenditure ratio is 14.5.

Table 27. Benefit to Cost Ratio of Energy-Efficiency and Renewable Energy

Sector	Total Cost of Efficiency and Renewables	Total Change in Consumer Expenditures	Total Benefit to Total Cost Ratio	Total Benefit to Consumer Cost Ratio
Natural Gas - Residential	\$2,137,577,147	\$-28,965,921,332	13.55	-17.84
Natural Gas - Commercial	\$395,769,910	\$-16,199,503,576	40.93	-51.49
Natural Gas - Industrial	\$727,150,313	\$-30,170,074,072	41.49	-50.06
Electric - Residential	\$9,863,479,003	\$-1,763,644,596	0.18	-0.24
Electric - Commercial	\$5,939,670,897	\$-1,688,852,069	0.28	-0.37
Electric - Industrial	\$3,377,800,301	\$-788,171,289	0.23	-0.29
Power Generation	NA	\$-24,360,986,280	-	-
Renewables	\$7,801,943,577	NA	-	-
Total	\$30,243,391,149	\$-103,937,153,213	3.44	4.50

It is important to note that while most of the costs are incurred from measures that affect electric power (i.e., electric efficiency and renewable energy), most of the benefits to end-use consumers accrue in the form of reductions in natural gas expenditures. The analysis does not allow for the determination of the relative impacts of electric efficiency and renewable energy on the total benefits.

Policy Mechanisms for Obtaining Results

Policymakers at the state and federal level could take a number of concrete actions to realize the benefits that would result from expanded energy efficiency and renewable energy resources. No single policy strategy would achieve the results outlined in our recent study (Elliott et al. 2003). Rather, a portfolio of strategies would be most likely to achieve quick and sustained savings from energy efficiency and renewable energy resources.

Energy Efficiency Performance Targets

One of the leading sources of energy efficiency savings are incentive and technical assistance programs operated by utilities and states. These programs reduced peak electric demand by 11% and electricity sales by 6% during the 2001 California electricity crisis. Other leading states are achieving regular savings on the order of 1% each year. Establishing binding savings targets for states built around the achievements of the most effective programs could expand these benefits to additional customers. Financing for these programs could come from state system benefit funds or through electric and gas rates. The benefits of these programs are typically on the order of two-times program costs, making them very cost-effective to consumers and businesses. Such targets could be established at the state level, as Texas has done (Kushler and Witte 2001), or at the federal level. Possible models are contained in electricity legislation drafted in 2002 by House Energy and Air Quality Subcommittee Chairman Joe Barton or the oil savings amendment adopted on the Senate floor in the spring of 2003 (Barton 2002).

Alternatively, states or the federal government could adopt system benefit funds, providing a stable source of funding for energy efficiency and renewable energy initiatives. State system benefit programs are proving themselves to be an attractive strategy for funding in many states where a small fee is collected on each unit of energy sold in the state (York and Kushler 2002). These funds are then used to support energy efficiency and renewable energy programs. These programs could also be funded by including them in electric and gas rates.

Regardless of whether programs are induced through the setting of targets or through providing a source of funding, these programs can be tailored to meet the unique needs of their states. Increasing the funding for existing programs represents a sound strategy for expanding the impact of energy efficiency and renewable energy resources. States that do not currently have significant programs should be encouraged to establish them through state or federal action.

Expanded Federal Funding for EERE Implementation Programs at DOE and EPA

If Americans are called upon to take action, government and public institutions must be prepared to provide people and businesses with direction and resources that target their energy and interests. The federal government should expand funding for existing energy efficiency and renewable energy programs at the U.S. Department of Energy (DOE) and Environmental Protection Agency (EPA). These agencies should be encouraged to partner with state and local governments, existing programs run by the public sector and utilities, and the private sector to leverage the agencies' funding for maximum impact.

The experience from the California response to the blackouts of 2001 should lead us to expand support for existing programs (Kushler and Vine 2003). These initiatives represented the installed infrastructure of energy efficiency and renewable energy resources. Federal initiatives such as ENERGY STAR® and Industrial Best Practices are already having impacts in the marketplace. Similarly, many state and regional initiatives are well positioned to channel funding into the market.

Appliance Efficiency Standards

Appliance standards have been one of the greatest energy policy successes over the past decade, transforming the energy use of many consumer and commercial products. While developing new standards from scratch takes a number of years, we have important standards waiting in the wings for a number of products that could result in important energy savings in the mid term, even as soon as 2005. At the federal level, the energy bill currently under consideration in Congress includes standards on six products that would go into effect in either 2005 or 2006. In addition, three federal rulemakings are underway that should move forward as quickly as possible, and additional rulemakings are behind legislatively mandated schedules and should begin soon. Standards for a number of products are also ready to be implemented at the state level. Model state legislation includes 10 products (some the same as in federal legislation), but California is considering as many as 25 products for state standards. Significant independent opportunities exist for both state and federal action. In addition, standards on additional products represent a critical long-term strategy that could deliver significant energy savings (Prindle et al. 2003).

Insuring More Efficient Buildings through Codes

As with appliance standards, buildings codes represent an energy efficiency success story. These specifications, administered at the local level, define how new residential commercial builds are constructed, and in some cases what upgrades need to be made when major renovations take place. Energy efficiency experts have developed model building codes that represent the current state of the art in design and construction practice. Buildings built to these codes have reduced heating and cooling requirements, and commercial office buildings require much less electricity for lighting (Prindle et al. 2003). Some localities have already adopted these codes, but others need to be encouraged to move quickly to implement these codes.

Support of Clean and Efficient Distributed Generation

One of the challenges faced by many renewable energy resources, as well as other clean distributed generation systems, is the interconnection and tariff practices of some utilities across the country. The federal government should work with state regulators to establish consistent interconnection standards and procedures, and remove tariffs and "exit fees" that act as disincentives to the development of new distributed resources (Brown and Elliott 2003).

State and federal governments should establish or increase customer incentives for renewable generation (such as solar and small wind generators) and clean distributed generation (such as combined heat and power systems). These incentives could take the form of tax credits or production incentives (Elliott 2001).

Renewable Portfolio Standards

A renewable portfolio standard (RPS) is a market-based policy that increases the diversity of our electricity supply by establishing a minimum commitment to generate electricity from renewable resources. The experiences of the 13 states that have implemented renewable portfolio standards have proven them an effective means of reducing market barriers and encouraging the installation of renewable energy technologies. Several states have successful programs that could be expanded (i.e., Texas, California, Connecticut, Iowa, and Wisconsin) and proposals are under consideration to establish renewable portfolio standards in several other states (ELPC 2001, UCS 2001, Marston 2003), such as New York (Greene 2003). The other states without renewable portfolio standards should be encouraged to implement them as has been proposed by several regional initiatives (ELPC 2001, REPP 2001, Nielsen 2003 and Shimshak 2003).

Because renewable energy can help meet critical national fuel diversity, energy security, economic, and environmental goals, a renewable portfolio standard should be a cornerstone of America's national energy policy. In July, the Senate passed a renewable portfolio standard requiring major electricity companies to obtain 10% of their electricity from renewable energy sources by 2020 (Senate 2003). A national renewable portfolio standard should also establish a minimum commitment that allows states to adopt higher standards.

In addition, tax credits, grants, and financing can play an important role as has been demonstrated for wind energy (Elliott 2001). It is important that the existing production tax credit for renewable energy sources (now slated to expire at the end of 2003) be extended through at least 2006. Grants and loans for renewable energy were part of the *Farm Bill of 2002* passed by the 107th Congress, and it is important that funding for future years be continued. Other tax credits and grants at both the state and federal levels for other renewable technologies should also be implemented, as has been proposed in the Senate Energy Bill. Several states (Oregon, Massachusetts, New York, and California) have designated that system benefit charges should be used to support renewable energy projects.

Public Awareness Campaign by State and National Leaders

Finally, our state and national leaders are in a unique position to raise public awareness of energy efficiency and renewables, and mobilize action to aid in the implementation of the strategies mentioned above. Witness the public response to Federal Reserve Chairman Alan Greenspan's Congressional testimonies. Our public leaders should use their position to issue a call to action by the people and businesses of America to take steps to improve their energy efficiency and encourage investment in renewable energy resources. The window of opportunity to effect significant savings is however limited as was learned in the Northwest in 2002. Once a market has adapted to higher electricity prices it is difficult to motivate public action. The lesson learned is that policy makers must also quickly mobilize the resources needed to support the public's actions as they were in California (Kushler and Vine 2003) if maximum results are to be achieved.

Conclusions, Discussions, and Recommendations

Energy efficiency and renewable energy resources can have a relatively quick moderating effect on natural gas markets, resulting in significant savings to the economy at an attractive cost.

As a result of these findings, it is clear that natural gas and electric efficiency and renewable energy resources should be important components in our response to our current natural gas price problems. A consensus appears to exist that in the near term, efficiency and renewable energy resources can be brought to the market faster than new wells can be drilled or new pipelines and liquefied natural gas (LNG) terminals could be built.

The findings of this study do not indicate that energy efficiency renewable energy are the only policy solution required to address the future natural gas needs of the United States. Additional sources of natural gas will be required whether from domestic sources such as the proposed pipeline to bring Alaskan gas to the lower-48 state, as has been explored in a recent report by the National Commission on Energy Policy (NCEP 2003), or through importation of gas in the form of LNG. However, due to energy efficiency and renewable energy resources' low cost and environmental impacts, these resources also can be an important part of the long-term solution reducing the rate of increase in demand. In addition, expanded energy efficiency and renewable energy resources provide national decision-makers with some breathing room to develop rational energy policies that can result in the lowest cost to consumers and to the environment. Research is underway by a number of groups ranging from the National Petroleum Council to the National Commission on Energy Policy, which has several analyses underway, to the Federal Reserve and Congress. Time is needed to complete and analyze the results of this research to develop a comprehensive natural gas policy. The questions are complex because of the interrelationships between natural gas, industrial production and electric power generation; thus, simple long-term solutions are not likely.

If we don't address the natural gas price problem, we will further damage our economy: industry will move overseas where prices are lower, and businesses and individual consumers will divert money from other purchases to pay higher natural gas and electricity bills. Efficiency and renewable energy may not completely solve our natural gas problems, but they represent an important part of the portfolio of policies needed to insure a healthy economy. Public and private leaders need to step up to the podium and issue a call to action to implement the policies and programs needed to realize the benefits that will result from increased use of energy efficiency and renewable energy. A window of opportunity may be closing in the near future, so leaders must act now if the full, cost-effective benefits of energy efficiency and renewable energy are to be realized. We have provided some concrete policy recommendations. These policies are relatively low-cost and the measures recommended are cost-effective from the customer's perspective. However, local, state, and federal governments all must be prepared to commit resources if this opportunity is to be realized.

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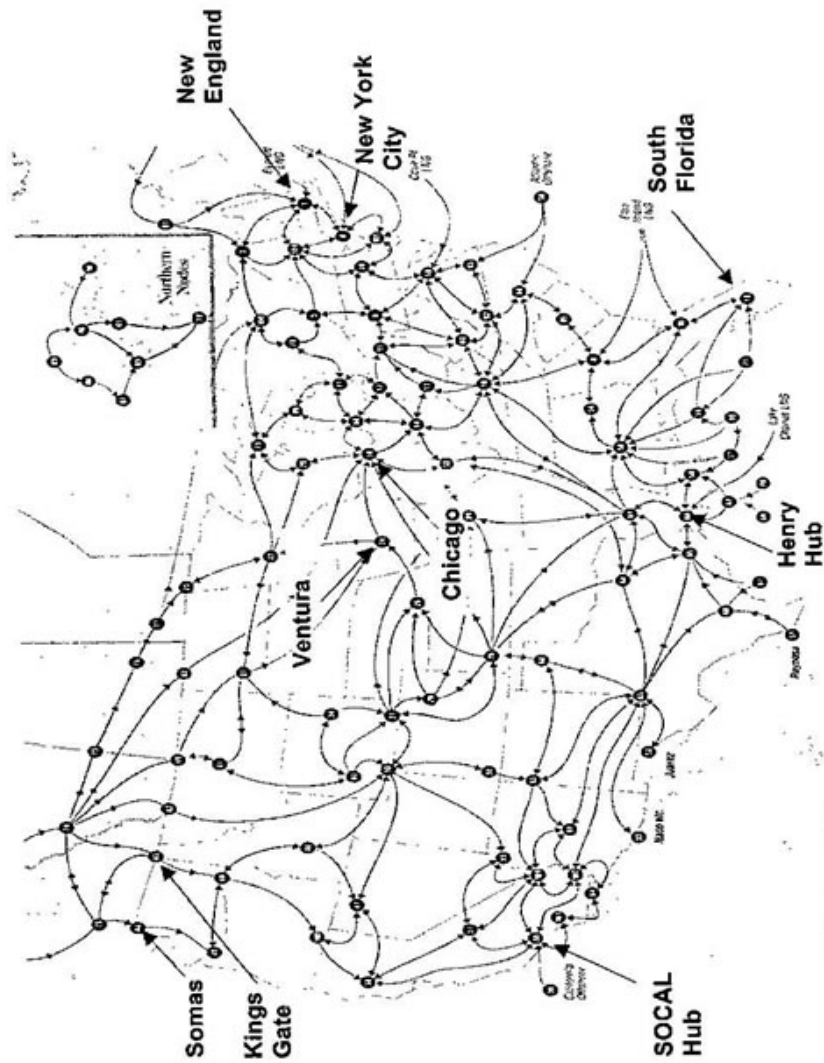
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Appendix A-The North American Natural Gas Transmission Network



Appendix B-Residential and Commercial Savings by State by Measure

Residential Natural Gas Savings by end use by state

State	Mbtu	Avg NG use/hh Summed, Weighted NG/per hh	Weighted for total fuel use in hhs with SH, WH, OT Avg NG Use as sum of parts			% By Enduse			% Enduse Sum of Parts			Adjusted Savings					
			SH (MBTU/hh)	WH (MBTU/hh)	OT (MBTU/hh)	SH	WH	OT	SH	WH	OT	Score	5 yr (%)				1 yr (%)
Alabama	30	30	21	7	2	69	24	7	69	24	7	d	2.9%	1.4%			
Arizona	56	37	20	15	2	35	27	4	53	41	6	b	4.5%	2.2%			
Arkansas	50	49	30	15	4	59	31	8	61	31	8	d	2.9%	1.4%	5 yr savings potential		5.20%
California	41	41	17	19	6	41	46	15	40	45	15	a	5.1%	2.6%	End-use multipliers		
Colorado	56	110	92	15	2	164	27	4	84	14	2	b	4.4%	2.2%	Space heating		1.00
Connecticut	31	33	24	7	2	75	22	7	72	21	6	a	5.2%	2.6%	Water heating		1.10
Delaware	181	26	18	6	2	10	4	1	69	24	6	b	4.4%	2.2%	Other		0.60
Florida	27	4	1	2	1	3	9	5	17	52	31	c	3.4%	1.7%			
Georgia	181	26	18	6	2	10	4	1	69	24	6	d	2.9%	1.4%			
Idaho	56	110	92	15	2	164	27	4	84	14	2	b	4.4%	2.2%			
Illinois	99	97	73	19	5	73	19	5	75	20	6	b	4.4%	2.2%			
Indiana	99	97	73	19	5	73	19	5	75	20	6	c	3.6%	1.8%			
Iowa	73	73	56	15	3	77	20	4	76	20	4	b	4.4%	2.2%			
Kansas	73	73	56	15	3	77	20	4	76	20	4	d	2.9%	1.4%			
Kentucky	30	30	21	7	2	69	24	7	69	24	7	d	2.9%	1.4%			
Louisiana	50	49	30	15	4	59	31	8	61	31	8	d	2.9%	1.4%			
Maine	31	33	24	7	2	75	22	7	72	21	6	a	5.2%	2.6%			
Maryland	68	62	46	11	5	67	17	7	74	18	8	b	4.4%	2.2%			
Massachusetts	31	33	24	7	2	75	22	7	72	21	6	a	5.2%	2.6%			
Michigan	99	97	73	19	5	73	19	5	75	20	6	b	4.4%	2.2%			
Minnesota	73	73	56	15	3	77	20	4	76	20	4	b	4.4%	2.2%			
Missouri	73	73	56	15	3	77	20	4	76	20	4	d	2.9%	1.4%			
Mississippi	30	30	21	7	2	69	24	7	69	24	7	d	2.9%	1.4%			
Montana	56	110	92	15	2	164	27	4	84	14	2	c	3.7%	1.8%			
Nebraska	73	73	56	15	3	77	20	4	76	20	4	d	2.9%	1.4%			
Nevada	56	37	20	15	2	35	27	4	53	41	6	c	3.7%	1.8%			
New Hampshire	31	33	24	7	2	75	22	7	72	21	6	b	4.4%	2.2%			
New Jersey	68	62	46	11	5	67	17	7	74	18	8	a	5.1%	2.6%			
New Mexico	56	37	20	15	2	35	27	4	53	41	6	d	2.9%	1.5%			
New York	57	53	36	12	5	63	22	8	68	23	9	a	5.1%	2.6%			
North Carolina	181	26	18	6	2	10	4	1	69	24	6	d	2.9%	1.4%			
North Dakota	73	73	56	15	3	77	20	4	76	20	4	d	2.9%	1.4%			
Ohio	99	97	73	19	5	73	19	5	75	20	6	c	3.6%	1.8%			
Oklahoma	50	49	30	15	4	59	31	8	61	31	8	d	2.9%	1.4%			
Oregon	159	81	48	23	10	30	14	6	59	28	12	a	5.1%	2.5%			
Pennsylvania	68	62	46	11	5	67	17	7	74	18	8	a	5.1%	2.6%			
Rhode Island	31	33	24	7	2	75	22	7	72	21	6	a	5.2%	2.6%			
South Carolina	181	26	18	6	2	10	4	1	69	24	6	d	2.9%	1.4%			
South Dakota	73	73	56	15	3	77	20	4	76	20	4	d	2.9%	1.4%			
Tennessee	30	30	21	7	2	69	24	7	69	24	7	c	3.6%	1.8%			
Texas	46	46	24	16	5	53	36	11	53	35	11	a	5.1%	2.6%			
Utah	56	110	92	15	2	164	27	4	84	14	2	b	4.4%	2.2%			
Vermont	31	33	24	7	2	75	22	7	72	21	6	a	5.2%	2.6%			
Virginia	181	26	18	6	2	10	4	1	69	24	6	c	3.6%	1.8%			
Washington	159	81	48	23	10	30	14	6	59	28	12	b	4.3%	2.2%			
West Virginia	181	26	18	6	2	10	4	1	69	24	6	d	2.9%	1.4%			
Wisconsin	99	97	73	19	5	73	19	5	75	20	6	a	5.2%	2.6%			
Wyoming	56	110	92	15	2	164	27	4	84	14	2	c	3.7%	1.8%			

Legend:
SH=Space Heating
WH= Water Heating
OT=Other
EP=Economic Potential
rh=Household

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Commercial Natural Gas Savings by State by Measure

State	Percent By Enduse				State Score	Adjusted Savings (%)				
	SH	WH	CK	OT		5 yr	1 yr			
Alabama	58	30	5	7	d	2.6%	1.3%			
Arizona	62	26	7	5	b	4.0%	2.0%	5 yr savings potential		4.70%
Arkansas	44	34	16	6	d	2.6%	1.3%	End-use multipliers		
California	31	42	17	11	a	4.8%	2.4%	Space heating		0.9
Colorado	62	26	7	5	b	4.0%	2.0%	Water heating		1.4
Connecticut	56	29	7	8	a	4.7%	2.3%	Cooking		0.6
Delaware	41	29	21	9	b	3.8%	1.9%	Other		0.6
Florida	41	29	21	9	c	3.1%	1.6%			
Georgia	41	29	21	9	d	2.5%	1.2%			
Idaho	62	26	7	5	b	4.0%	2.0%			
Illinois	67	22	8	4	b	3.9%	1.9%			
Indiana	67	22	8	4	c	3.2%	1.6%			
Iowa	77	19	3	0	b	3.9%	2.0%			
Kansas	77	19	3	0	d	2.6%	1.3%			
Kentucky	58	30	5	7	d	2.6%	1.3%			
Louisiana	44	34	16	6	d	2.6%	1.3%			
Maine	56	29	7	8	a	4.7%	2.3%			
Maryland	41	29	21	9	b	3.8%	1.9%			
Massachusetts	56	29	7	8	a	4.7%	2.3%			
Michigan	67	22	8	4	b	3.9%	1.9%			
Minnesota	77	19	3	0	b	3.9%	2.0%			
Missouri	77	19	3	0	d	2.6%	1.3%			
Mississippi	58	30	5	7	d	2.6%	1.3%			
Montana	62	26	7	5	c	3.3%	1.6%			
Nebraska	77	19	3	0	d	2.6%	1.3%			
Nevada	62	26	7	5	c	3.3%	1.6%			
New Hampshire	58	29	7	8	b	4.0%	2.0%			
New Jersey	55	23	11	12	a	4.5%	2.2%			
New Mexico	62	26	7	5	d	2.6%	1.3%			
New York	55	23	11	12	a	4.5%	2.2%			
North Carolina	41	29	21	9	d	2.5%	1.2%			
North Dakota	77	19	3	0	d	2.6%	1.3%			
Ohio	67	22	8	4	c	3.2%	1.6%			
Oklahoma	44	34	16	6	d	2.6%	1.3%			
Oregon	31	42	17	11	a	4.8%	2.4%			
Pennsylvania	55	23	11	12	a	4.5%	2.2%			
Rhode Island	56	29	7	8	a	4.7%	2.3%			
South Carolina	41	29	21	9	d	2.5%	1.2%			
South Dakota	77	19	3	0	d	2.6%	1.3%			
Tennessee	58	30	5	7	c	3.3%	1.7%			
Texas	44	34	16	6	a	4.7%	2.4%			
Utah	62	26	7	5	b	4.0%	2.0%			
Vermont	56	29	7	8	a	4.7%	2.3%			
Virginia	41	29	21	9	c	3.1%	1.6%			
Washington	31	42	17	11	b	4.1%	2.1%			
West Virginia	41	29	21	9	d	2.5%	1.2%			
Wisconsin	67	22	8	4	a	4.6%	2.3%			
Wyoming	62	26	7	5	c	3.3%	1.6%			



Commercial Electricity Savings by State by Measure

State	Percent By Enduse										Score	Adjusted 5 Yr Savings %	1 Yr Savings %			
	SH	CL	VE	WH	LI	CK	RE	OE	OT							
Alabama	6	16	5	2	44	1	8	11	8	d		3.6%	1.8%			
Arizona	4	13	7	2	46	1	7	14	7	c		4.7%	2.4%	5 yr savings potent		6.70%
Arkansas	2	19	7	1	43	1	8	11	8	d		3.7%	1.9%	End-use multipliers		
California	5	10	6	1	48	1	7	15	8	a		6.7%	3.4%	Space heating		0.2
Colorado	4	13	7	2	46	1	7	14	7	c		4.7%	2.4%	Cooling		1
Connecticut	2	10	5	3	51	1	6	13	8	a		6.8%	3.4%	Ventilation		0.9
Delaware	4	16	6	2	43	1	6	13	8	c		4.7%	2.3%	Water heating		0.6
Florida	4	16	6	2	43	1	6	13	8	c		4.7%	2.3%	Lighting		1.2
Georgia	4	16	6	2	43	1	6	13	8	c		4.7%	2.3%	Cooking		0.5
Idaho	4	13	7	2	46	1	7	14	7	b		5.8%	2.9%	Refrigeration		0.8
Illinois	4	11	6	2	47	1	7	13	9	b		5.7%	2.8%	Office equipment		1.1
Indiana	4	11	6	2	47	1	7	13	9	b		5.7%	2.8%	Other		0.5
Iowa	4	10	7	1	50	0	5	14	8	b		5.8%	2.9%			
Kansas	4	10	7	1	50	0	5	14	8	d		3.8%	1.9%			
Kentucky	6	16	5	2	44	1	8	11	8	d		3.6%	1.8%			
Louisiana	2	19	7	1	43	1	8	11	8	d		3.7%	1.9%			
Maine	2	10	5	3	51	1	6	13	8	a		6.8%	3.4%			
Maryland	4	16	6	2	43	1	6	13	8	b		5.7%	2.8%			
Massachusetts	2	10	5	3	51	1	6	13	8	a		6.8%	3.4%			
Michigan	4	11	6	2	47	1	7	13	9	c		4.7%	2.3%			
Minnesota	4	10	7	1	50	0	5	14	8	b		5.8%	2.9%			
Missouri	4	10	7	1	50	0	5	14	8	d		3.8%	1.9%			
Mississippi	6	16	5	2	44	1	8	11	8	d		3.6%	1.8%			
Montana	4	13	7	2	46	1	7	14	7	c		4.7%	2.4%			
Nebraska	4	10	7	1	50	0	5	14	8	d		3.8%	1.9%			
Nevada	4	13	7	2	46	1	7	14	7	c		4.7%	2.4%			
New Hampshire	2	10	5	3	51	1	6	13	8	b		5.8%	2.9%			
New Jersey	5	10	6	2	48	0	9	12	9	a		6.6%	3.3%			
New Mexico	4	13	7	2	46	1	7	14	7	d		3.7%	1.9%			
New York	5	10	6	2	48	0	9	12	9	a		6.6%	3.3%			
North Carolina	4	16	6	2	43	1	6	13	8	d		3.7%	1.8%			
North Dakota	4	10	7	1	50	0	5	14	8	d		3.8%	1.9%			
Ohio	4	11	6	2	47	1	7	13	9	c		4.7%	2.3%			
Oklahoma	2	19	7	1	43	1	8	11	8	d		3.7%	1.9%			
Oregon	5	10	6	1	48	1	7	15	8	a		6.7%	3.4%			
Pennsylvania	5	10	6	2	48	0	9	12	9	c		4.6%	2.3%			
Rhode Island	2	10	5	3	51	1	6	13	8	a		6.8%	3.4%			
South Carolina	4	16	6	2	43	1	6	13	8	d		3.7%	1.8%			
South Dakota	4	10	7	1	50	0	5	14	8	d		3.8%	1.9%			
Tennessee	6	16	5	2	44	1	8	11	8	c		4.6%	2.3%			
Texas	2	19	7	1	43	1	8	11	8	a		6.7%	3.4%			
Utah	4	13	7	2	46	1	7	14	7	b		5.8%	2.9%			
Vermont	2	10	5	3	51	1	6	13	8	a		6.8%	3.4%			
Virginia	4	16	6	2	43	1	6	13	8	c		4.7%	2.3%			
Washington	5	10	6	1	48	1	7	15	8	b		5.7%	2.9%			
West Virginia	4	16	6	2	43	1	6	13	8	d		3.7%	1.8%			
Wisconsin	4	11	6	2	47	1	7	13	9	a		6.7%	3.3%			
Wyoming	4	13	7	2	46	1	7	14	7	c		4.7%	2.4%			

Legend:

CL=Cooling
VE=Ventilation
LI=Lighting
CK=Cooking
RE=Refrigeration
OE=Office Equipment
SH=Space Heating
WH=Water Heating
OT=Other
EP=Economic Potential

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Residential Electricity Use Savings by State by Measure

State	Elec Use	MBTU/hh				% Enduse				score	Adjusted Savings				
		SH	WH	OT	AC	SH	WH	OT	AC		5 yr	1 yr			
Alabama	49	11	3	28	7	22	6	58	14	d	3.2%	1.6%			
Arizona	35	3	3	23	6	9	9	65	18	c	4.1%	2.1%	5 yr savings potent	6.70%	
Arkansas	50	10	2	28	9	21	5	56	18	d	3.2%	1.6%	End-use multipliers		
California	20	2	0	17	1	9	2	82	7	a	5.7%	2.8%	Space heating	0.8	
Colorado	31	4	3	23	1	12	10	75	3	c	3.9%	2.0%	Cooling	1.2	
Connecticut	26	4	3	18	1	16	11	71	3	a	5.6%	2.8%	Water heating	1	
Delaware	39	5	3	29	2	14	8	74	4	c	3.9%	2.0%	Other	0.9	
Florida	45	2	4	27	12	5	8	59	27	c	4.3%	2.1%			
Georgia	51	9	12	24	5	18	24	48	10	c	4.1%	2.0%			
Idaho	31	4	3	23	1	12	10	75	3	b	4.8%	2.4%			
Illinois	32	5	2	23	2	14	7	71	7	b	4.8%	2.4%			
Indiana	34	5	2	25	2	14	7	73	6	b	4.8%	2.4%			
Iowa	38	7	3	25	4	18	9	64	9	b	4.8%	2.4%			
Kansas	38	7	3	25	4	18	9	64	9	d	3.1%	1.6%			
Kentucky	49	11	3	28	7	22	6	58	14	d	3.2%	1.6%			
Louisiana	50	10	2	28	9	21	5	56	18	d	3.2%	1.6%			
Maine	26	4	3	18	1	16	11	71	3	a	5.6%	2.8%			
Maryland	51	9	12	24	5	18	24	48	10	b	4.9%	2.5%			
Massachusetts	26	4	3	18	1	16	11	71	3	a	5.6%	2.8%			
Michigan	32	5	2	23	2	14	7	71	7	c	4.0%	2.0%			
Minnesota	38	7	3	25	4	18	9	64	9	b	4.8%	2.4%			
Missouri	38	7	3	25	4	18	9	64	9	d	3.1%	1.6%			
Mississippi	49	11	3	28	7	22	6	58	14	d	3.2%	1.6%			
Montana	31	4	3	23	1	12	10	75	3	c	3.9%	2.0%			
Nebraska	38	7	3	25	4	18	9	64	9	d	3.1%	1.6%			
Nevada	35	3	3	23	6	9	9	65	18	c	4.1%	2.1%			
New Hampshire	26	4	3	18	1	16	11	71	3	b	4.8%	2.4%			
New Jersey	39	5	3	29	2	14	8	74	4	a	5.6%	2.8%			
New Mexico	35	3	3	23	6	9	9	65	18	d	3.3%	1.6%			
New York	21	3	0	17	1	13	1	81	5	a	5.6%	2.8%			
North Carolina	51	9	12	24	5	18	24	48	10	d	3.2%	1.6%			
North Dakota	38	7	3	25	4	18	9	64	9	d	3.1%	1.6%			
Ohio	32	5	2	23	2	14	7	71	7	c	4.0%	2.0%			
Oklahoma	50	10	2	28	9	21	5	56	18	d	3.2%	1.6%			
Oregon	42	11	5	26	1	25	11	61	2	a	5.5%	2.8%			
Pennsylvania	39	5	3	29	2	14	8	74	4	c	3.9%	2.0%			
Rhode Island	26	4	3	18	1	16	11	71	3	a	5.6%	2.8%			
South Carolina	51	9	12	24	5	18	24	48	10	d	3.2%	1.6%			
South Dakota	38	7	3	25	4	18	9	64	9	d	3.1%	1.6%			
Tennessee	49	11	3	28	7	22	6	58	14	c	4.0%	2.0%			
Texas	48	7	1	29	10	15	2	62	22	a	5.9%	3.0%			
Utah	31	4	3	23	1	12	10	75	3	b	4.8%	2.4%			
Vermont	26	4	3	18	1	16	11	71	3	a	5.6%	2.8%			
Virginia	51	9	12	24	5	18	24	48	10	c	4.1%	2.0%			
Washington	42	11	5	26	1	25	11	61	2	b	4.7%	2.3%			
West Virginia	51	9	12	24	5	18	24	48	10	d	3.2%	1.6%			
Wisconsin	32	5	2	23	2	14	7	71	7	a	5.7%	2.8%			
Wyoming	31	4	3	23	1	12	10	75	3	c	3.9%	2.0%			

Legend:
SH=Space Heating
WH= Water Heating
AC= Air Conditioning
OT=Other
EP=Economic Potential
hh=Household

CHANGE IN RESIDENTIAL GAS DEMAND

MMcf	2004	2005	2006	2007	2008
AL	-606	-614	-637	-615	-693
AZ	-870	-959	-1,051	-1,136	-1,297
AR	-1,177	-1,336	-1,495	-1,661	-1,911
CA	-12,595	-14,066	-15,343	-16,603	-18,781
CO	-2,451	-2,707	-3,168	-3,460	-4,110
CT	-1,127	-1,266	-1,405	-1,539	-1,756
DE	-221	-247	-272	-298	-339
DC	-189	-206	-223	-239	-272
FL	-213	-224	-231	-237	-266
GA	-1,709	-1,740	-1,775	-1,762	-1,991
ID	-384	-428	-477	-525	-614
IL	-10,954	-12,029	-13,082	-14,162	-16,165
IN	-3,004	-3,201	-3,386	-3,573	-4,056
IA	-1,635	-1,769	-1,907	-2,045	-2,327
KS	-1,014	-1,019	-1,019	-1,015	-1,139
KY	-1,135	-1,190	-1,246	-1,288	-1,463
LA	-803	-848	-893	-938	-1,072
ME	-26	-29	-32	-36	-41
MD	-1,731	-1,886	-2,036	-2,181	-2,490
MA	-2,995	-3,364	-3,733	-4,089	-4,664
MI	-8,340	-9,170	-9,995	-10,821	-12,362
MN	-3,002	-3,320	-3,637	-3,965	-4,559
MS	-1,065	-1,210	-1,354	-1,503	-1,723
MO	-1,564	-1,567	-1,559	-1,547	-1,719
MT	-357	-374	-396	-414	-474
NE	-602	-604	-604	-602	-673
NV	-624	-675	-720	-766	-878
NH	-184	-207	-230	-252	-287
NJ	-6,165	-6,987	-7,809	-8,653	-9,969
NM	-1,251	-1,454	-1,667	-1,868	-2,183
NY	-10,112	-11,432	-12,733	-13,907	-15,821
NC	-839	-864	-883	-890	-1,008
ND	-200	-209	-222	-232	-266
OH	-6,041	-6,400	-6,734	-7,067	-7,983
OK	-955	-959	-959	-956	-1,072
OR	-1,071	-1,199	-1,341	-1,465	-1,707
PA	-6,646	-7,424	-8,188	-8,961	-10,210
RI	-489	-550	-610	-668	-762
SC	-404	-415	-422	-424	-478
SD	-259	-280	-302	-324	-368
TN	-1,091	-1,144	-1,197	-1,237	-1,407
TX	-5,392	-6,014	-6,617	-7,247	-8,332
UT	-2,060	-2,414	-2,796	-3,212	-3,731
VT	-67	-75	-84	-92	-105
VA	-2,003	-2,269	-2,537	-2,807	-3,229
WA	-1,591	-1,778	-1,989	-2,174	-2,515
WV	-423	-425	-424	-422	-472
WI	-3,669	-4,136	-4,604	-5,090	-5,855
WY	-680	-781	-891	-1,017	-1,181
US	-111,986	-123,464	-134,915	-145,986	-166,782

CHANGE IN COMMERCIAL GAS DEMAND

MMcf	2004	2005	2006	2007	2008
AL	-259	-136	-40	142	193
AZ	-511	-384	-272	-110	-67
AR	-719	-661	-598	-519	-564
CA	-5,120	-4,533	-3,740	-2,709	-2,654
CO	-1,070	-828	-851	-600	-783
CT	-996	-900	-793	-618	-630
DE	-113	-98	-81	-61	-61
DC	-246	-185	-120	-33	-13
FL	-560	-383	-188	54	115
GA	-551	-263	4	383	517
ID	-207	-163	-122	-65	-62
IL	-4,177	-3,328	-2,428	-1,376	-1,215
IN	-1,138	-785	-409	24	169
IA	-769	-571	-375	-146	-89
KS	-513	-252	7	308	419
KY	-507	-327	-147	83	159
LA	-400	-244	-89	97	155
ME	-64	-58	-51	-40	-40
MD	-968	-727	-471	-130	-51
MA	-2,354	-2,127	-1,874	-1,461	-1,488
MI	-3,351	-2,685	-1,983	-1,134	-1,007
MN	-1,617	-1,301	-969	-577	-539
MS	-576	-533	-485	-424	-454
MO	-694	-365	-24	367	534
MT	-174	-102	-39	41	64
NE	-335	-157	11	211	280
NV	-330	-217	-92	58	119
NH	-175	-158	-139	-108	-110
NJ	-3,633	-3,210	-2,721	-2,054	-2,088
NM	-882	-874	-896	-832	-1,014
NY	-6,873	-6,183	-5,395	-3,807	-3,701
NC	-440	-212	21	328	459
ND	-143	-84	-32	34	53
OH	-2,526	-1,747	-914	47	371
OK	-443	-217	6	266	362
OR	-697	-580	-480	-309	-315
PA	-1,767	-1,533	-1,275	-949	-950
RI	-304	-274	-242	-188	-192
SC	-189	-89	8	139	189
SD	-162	-120	-79	-31	-19
TN	-707	-456	-206	116	222
TX	-4,027	-3,467	-2,869	-2,121	-2,248
UT	-1,203	-1,270	-1,377	-1,524	-1,829
VT	-71	-64	-56	-44	-45
VA	-1,460	-1,342	-1,210	-1,008	-1,089
WA	-872	-725	-597	-385	-366
WV	-282	-134	22	206	288
WI	-1,877	-1,659	-1,414	-1,118	-1,164
WY	-579	-564	-571	-603	-725
US	-57,635	-47,276	-36,632	-22,180	-20,906